Effectiveness of Using EDPuzzle – A Study in Velammal College of Engineering & Technology

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Abstract: Education is evolving every second, and so are the instructional materials. However, the video materials continue to be one of the most interesting and effective teaching tools in higher education. They not only help students learn by seeing it visually in their own convenient pace but also remain flexible enough to watch recurrently to grasp and retain information. These video materials are made even more engaging by applying the tool named EDPuzzle, which helps the instructors embed the questions intermittently throughout the video lectures to check their understanding of the concepts. If the question is answered, the video resumes; else it demands the keen attention and response from the students. This helps the instructors determine the students’ understanding level in terms of the details of the content and the time taken to accomplish. The objective of this study was to examine the effectiveness of EDPuzzle in the learning process. To facilitate this evaluation, a survey was conducted on a class of 59 using a questionnaire designed with a five-point Likert scale based closed ended questions. A descriptive statistical method was used for data analysis. The results showed that EDPuzzle, which has proved to be user-friendly, commands better interaction and student engagement resulting in active learning. The findings acknowledge the need to train instructors and students to use EDPuzzle for a better learning experience. Further, there is scope to investigate the contribution of EDPuzzle to content learning, which will contribute to better academic performance.

Keywords: EDPuzzle, interactive tool, videos, learning, teaching.
1. Introduction

Video materials are the tools that entertain and inform the students because these teaching aids are animated, colorful, and visually delightful. These video materials are often used by the instructors to effectively communicate and transfer the knowledge to the students. However, a question remains how much the video has commanded student engagement in terms of learning or comprehending. EDPuzzle, an interactive tool, is used to embed the questions then and there on the videos so that the students can on the spot answer them and instantaneously verify their level of understanding. This helps the instructor keep track of the progress of the students and devise an action plan for further development accordingly. Keeping this in mind, this study intends to evaluate the effectiveness of the EDPuzzle among a class of students at Velammal College of Engineering & Technology, Madurai. This tool was chosen because it is available free of cost and identified to be useful in enhancing the concentration level of the students. Therefore, it becomes essential to analyze its effectiveness in terms of enriching the learning experience.

2. Literature Review

The world witnessed an upheaval [36], [43] when coronavirus (COVID-19) was identified in China in December 2019 [30]. The World Health Organization abbreviated it as (COVID-19) on February 11, 2020 and [11] clarified it to be the widest plague of atypical pneumonia. Owing to this, the normal routine was disrupted as there was indefinite closure of educational institutes [13], [46]. It obviously became a challenge to manage academics in a lock down situation [44]. During this phase, the online education came into the picture [15], [26] in various forms and so are the instructional materials [25].

With hardly any training and motivation, the instructors and students who are considered to “digital natives” by [34] had to switch over to online education using Google Meet, MS Teams, or Zoom worldwide [10]. Gradually they put efforts to cope with the pandemic situation and manage to gain fruitful experiences [3]. Many studies like [9], [40], [46] have examined the challenges of online education, especially with reference to instructional materials [1]-[2]. However, not so much study has been carried out on video materials, especially in the southern part of India. Hence, this study evaluates the effectiveness of an interactive tool embedded in videos.

The instructors found it easy to infuse more of audio-visual materials to make their pedagogies interesting and engaging and this resulted in improved student engagement [20], [22]. The instructors felt that the video materials were really welcomed much by the students as confirmed by [31], thus, “several studies on the use of technology in the classroom have shown a positive impact on the motivation of learners”. However, the effectiveness of the understanding of the content remained a million-dollar question to be answered. To manage this, EDPuzzle was introduced, which lets teachers embed questions intermittently in the video for the students to answer; the video resumes if only the students respond to the questions. This helps the instructors track the performance of the students and their levels of understanding too.

2.1. Features of EDPuzzle

The EDPuzzle allows the instructors to edit the video, adding multiple choice questions, and true or false tasks, match the following or open-ended questions as per the suitability of the content. The instructors can easily add an audio or text to intensify the learning experience for the better academic performance. Even cropping the video, assessing the questions and giving the feedback are made easy and instantly possible with the help of EDPuzzle. Additionally, it lays the platform to access many inspiring shows like TED Talks, Khan Academy etc. that are informative, motivating and engaging. The study conducted by [29] spells out that the students perform better in assessments because the EDPuzzle provides the students a platform to learn autonomously at their own pace and this is acknowledged by [4] as well. Moreover, the students get the results instantly [32]. It is for these reasons, both instructors and students prefer the EDPuzzle as put forth by [21].

As affirmed in [41], EDPuzzle can facilitate varied types of learning. According to [8], EDPuzzle is noteworthy for being free and hassle-free. It provides user-friendly access and the instructors can keep track of how many times a student has attempted to watch a portion or entire of the video. This helps the instructors analyze the comprehending capabilities of the students and the problem areas of the videos. EDPuzzle enriches the probability of inserting questions in learning platforms like Moodle or assigning a task to a specific student or a student group [27]. The instructors can monitor the performance of each student in the group
activities. If a student attempts to watch something on a new tab while performing the task, the task enabled video will automatically stop. However, this is impossible when a student attempts to watch something else in a new window [28]. Also, the instructors can opt to use or edit changes in someone’s EDPuzzle videos if they consider it right [7].

3. Methodology
A survey was conducted using a questionnaire consisting of 10 closed ended questions with a five-point Likert scale. Descriptive statistical analysis was carried out using IBM SPSS. In this study, 59 undergraduate students of III year of Electrical and Electronics Engineering of Velammal College of Engineering and Technology, Madurai, in the state of Tamil Nadu, India, participated, including 27 male students and 32 female students. These students were exposed to the use of EDPuzzle during online classes administered using the Google classroom platform during the pandemic period. The following is the flowchart from the research:

- Formulation of Research Problem
- Background Research
- Sample Questionnaire
- Finetuning of the Questionnaire
- Validity Check Using Cronbach alpha
- Actual Survey Questionnaire
- Administering the Questionnaire
- Factor Analysis using SPSS
- Interpretation of Data
- Conclusion

Figure 3 shows the means of question items generated with the help of IBM SPSS. It has been observed that user friendliness has got the highest means followed by interaction, engagement, joyfulness and dynamism, motivation, recommendation and participation. All the parameters got the means of more than 3.00 except the mean of the item, “Focus” that is 2.81. This clearly suggests that the application needs enhancement in terms of achieving nominal focus.

Table 1 shows the descriptive statistical data collected for all parameters. It was observed that there are some participants who strongly disagreed with the parameters of focus, better feedback and understanding. Parameters like focus, motivation, participation and joyfulness and dynamism have not been strongly agreed with by any student.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Err.</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Focus</td>
<td>1</td>
<td>4</td>
<td>2.81</td>
<td>0.09</td>
<td>0.73</td>
</tr>
<tr>
<td>2</td>
<td>Better Feedback</td>
<td>1</td>
<td>5</td>
<td>3.17</td>
<td>0.12</td>
<td>0.95</td>
</tr>
<tr>
<td>3</td>
<td>Understanding</td>
<td>1</td>
<td>5</td>
<td>3.37</td>
<td>0.11</td>
<td>0.86</td>
</tr>
<tr>
<td>4</td>
<td>Participation</td>
<td>2</td>
<td>4</td>
<td>3.41</td>
<td>0.07</td>
<td>0.59</td>
</tr>
<tr>
<td>5</td>
<td>Recommendation</td>
<td>2</td>
<td>5</td>
<td>3.41</td>
<td>0.09</td>
<td>0.72</td>
</tr>
<tr>
<td>6</td>
<td>Motivation</td>
<td>2</td>
<td>4</td>
<td>3.44</td>
<td>0.08</td>
<td>0.65</td>
</tr>
<tr>
<td>7</td>
<td>Joyfulness and Dynamism</td>
<td>2</td>
<td>4</td>
<td>3.51</td>
<td>0.08</td>
<td>0.65</td>
</tr>
<tr>
<td>8</td>
<td>Engagement</td>
<td>2</td>
<td>5</td>
<td>3.51</td>
<td>0.08</td>
<td>0.67</td>
</tr>
<tr>
<td>9</td>
<td>Interaction</td>
<td>2</td>
<td>5</td>
<td>3.54</td>
<td>0.08</td>
<td>0.65</td>
</tr>
<tr>
<td>10</td>
<td>User Friendliness</td>
<td>2</td>
<td>5</td>
<td>3.61</td>
<td>0.10</td>
<td>0.83</td>
</tr>
</tbody>
</table>

5. Discussion
5.1 Content
The authors selected 50.57-minute YouTube video content on the Interpretation of Graphs, Charts and Diagrams produced by Doordarshan, Odisha, in
collaboration with ISRO EDUSAT. With the integration of the EDPuzzle it was communicated to the students through Google Classroom. The video was given to 59 students of Electrical and Electronics Engineering as an assignment in January 2020. Eight multiple choice questions and two open-ended questions with a time gap of 5 to 8 min were added to the video with the setting of ‘prevent skipping’ to ensure that the students watched the content for all 50.57 minutes and answered all the questions. Closed ended responses were auto-corrected and open-ended questions were graded by the instructor. The first multiple choice question with four options got 75% right answer and the other three wrong options got the percentage of 8, 6, and 13, respectively. In the second multiple choice question with three options, 96% got the right answer and the other two wrong options were 0% and 4% respectively. This brings into light the student progression with respect to understanding of the content.

5.2. Time
A total time of 3907 min was put in by 59 students with an average of 128 min, 120 min being the maximum and 51 being the minimum minutes spent by the participants in the EDPuzzle video lesson. 17 participants completed the assignment on time. 11 took 5 min more than the actual time; 22 participants took 60-minute time i.e., 8 min extra and 10 participants took more than 60 min to complete the task.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Duration</th>
<th>No of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>56</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>60+</td>
<td>10</td>
</tr>
</tbody>
</table>

This helps keep track of the progress of the students’ understanding of the content, grasping of the ideas, and comprehending the concepts.

5.3. Comparison with Other Studies
The outcome that the instructors and students found EDPuzzle to be more effective in teaching and learning agrees with the research pursuits of [6], [23], [24], [27], [33], [37], & [39]. EDPuzzle facilitates improved interaction even in asynchronous settings and this is confirmed by [5], [12], [16], & [42] and the audio-visual representations do a demonstrative teaching, enhancing the chances of understanding the content, which is acknowledged by [35], as well.

Further, EDPuzzle keeps the students motivated as proposed by [19], enhances their theoretical understanding according to [14], & [18], [38], and these are reflected in the results of this study too. Significantly, EdPuzzle is considered more effective than other interactive tools, which is in sync with the findings of (as cited in [17]).

5.4. Findings
The interactive tool, EDPuzzle, is proven to be user-friendly and commands more student engagement as they actively learn using any of their smart devices at their own pace by answering the questions then and there. Hence, the infusion of EDPuzzle in the video-based lecturing is proved effective and it contributes to better academic performance. Additionally, EDPuzzle helps the instructors keep track of the students’ pace of study, which, in turn, supports in identifying the challenging area/areas of the videos for a better understanding. Instant feedback from the instructors is an added advantage to make EDPuzzle all the more likable, which is yet to be achieved according to the study. Developing the feedback parameter could enhance the understanding of the content. If properly devised and used, EDPuzzle can intensify the student participation, the quality and quantity of focus, which could be commendable.

5.5. Implication and Explanation of Findings
The study highlights the changing role of an instructor these days. The instructor does not have to teach conventionally or complete the syllabus. He or she should be tech-savvy, ready to exploit the available online tools to generate creative instructional materials to make the classes interesting and engaging. He or she should be aware of the varied skillsets of the students and design pedagogies that are inclusive of students with different levels of understanding. Hence, infusing digital interactive tools becomes indispensable. Educationists must understand the changing parameters of an able instructor and invest and promote upgrading the technologies behind such interactive tools like EDPuzzle as these help the instructors conduct classes in a more effective manner.

6. Conclusion

6.1. Strengths
- EDPuzzle helps in making video materials more interesting to the students.
- It pauses when a new tab is opened and this helps in identifying the students who are distracted.
- It also provides auto correction of MCQ questions.
- It helps instructors customize the video and types of questions.

6.2. Recommendations
After observing the data carefully, it can be said that the first three parameters have not scored high means as some students find them not very attractive. It is recommended to further probe into these parameters to redesign or upgrade EDPuzzle. It is recommended that
the EDPuzzle application should be recreated to generate more focused learning, giving instant feedback so that participation and motivation can be sustained high throughout the video. The integration of EDpuzzle into the instructional materials should be encouraged. Designing the pedagogy, keeping the use of EDpuzzle in mind, could be initiated. Assessment of the knowledge of study skills and cognition of the students against their background will make the picture very clear as to what kind of questions should be embedded in the content of the EDPuzzle.

6.3. Limitations

- The students who participated in the study were from different socio-economic backgrounds that raise questions on their level of understanding with respect to digital skills and interactive tools.
- Regarding the sample size, it is not so large enough to be conclusive.
- Students’ awareness of the content well before the study was also a matter of concern. Though, most of them expressed their liking of the exposure to EDPuzzle. The effectiveness of the EDPuzzle is not evaluated against the cognition or the pre-knowledge of the content.
- Learning Management System (LMS) platforms like Moodle do not accommodate EDPuzzle. This limited the preferences among the instructors.
- Intermittent Internet remains a perennial problem while accessing such interactive tools hampers the teaching learning process.

6.4. Future Research

EDPuzzle can be compared with other such noteworthy interactive tools to identify the drawbacks in EDPuzzle for further betterment. Qualitative research with a focus on content could be initiated. Further research can be done to enhance the video-based learning app to retain interest among the users. The effectiveness of the feedback rendered on EDPuzzle should also be evaluated. The effectiveness of group work with EDPuzzle and assessment of the same need further investigation.

Appendix 1

<table>
<thead>
<tr>
<th>Item</th>
<th>SCALE OF 1-5 (Strongly Disagree-Strongly Agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Do you find more focus when you are using EDPuzzle when compared to watching videos without this application?</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2 Do you understand better while using the application?</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3 Do you feel joyful and dynamic while using this application?</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4 Do you feel more engaged during your participation?</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5 Do you get better feedback of your understanding after using this application?</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

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